Fishery Management Report No. 12-49

Pasagshak River Weir Report, 2012

by

Mark J. Witteveen

December 2012

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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ABSTRACT

A fish counting weir was installed in the Pasagshak River during 2012 by Alaska Department of Fish and Game to enumerate sockeye salmon *Oncorhynchus nerka* escapement into Lake Rose Teed. Escapement was enumerated through a conventional wood tripod and aluminum panel weir daily from June 8 through August 15. The total estimated sockeye salmon escapement was 4,585 fish with peak passage occurring during late June and early July. Additionally, 25 pink salmon *O. gorbuscha,* and 125 chum salmon *O. keta* were counted through the weir. Sockeye salmon were sampled for age, sex, and length from an upstream trap built onto the weir and from the subsistence gillnet harvest. The average length of Pasagshak River sockeye salmon escapement was 533 mm and the dominant age class was age 1.3 (54.8%). The Pasagshak River sockeye salmon escapement consisted of approximately 54% females and 46% males.

Key words: sockeye salmon, ASL, subsistence, Pasagshak River, Lake Rose Teed

INTRODUCTION

Pasagshak River, located on the Kodiak road system (Figures 1 and 2), has recently supported the largest sockeye salmon *Oncorhynchus nerka* subsistence fishery in the City of Kodiak Area (J. Shaker, Fish and Wildlife Technician III, ADF&G, Kodiak, unpublished data; Figures 3 and 4). During the past two decades, subsistence harvest of Pasagshak River sockeye salmon has increased disproportionate to escapement (Figure 3). Previous escapement enumeration methodology provided only postseason estimates via aerial and foot surveys of the spawning grounds, making inseason subsistence and sport fisheries management difficult and refinement of an escapement goal for this stock problematic. A conventional wood tripod and aluminum picket weir was constructed near the outlet of the lake by the Alaska Department of Fish and Game (ADF&G) in 2011 and 2012 to provide timely and accurate escapement information to help maintain the sustainability of this salmon run important to subsistence and recreation.

The Pasagshak River is located on the northeast side of Kodiak Island and is accessible by car from the city of Kodiak (Figure 1). Lake Rose Teed (formerly spelled Rose Tead), which drains into the Pasagshak River, is a small, shallow lake (0.94 km^2; 2.1 m average depth). Prior to the 1964 earthquake and subsequent tsunami, Lake Rose Teed had little salmon rearing habitat; however, the earthquake lowered the elevation of the lake, allowing nutrient rich marine water to enter the lake during high tide cycles, dramatically increasing the salmon rearing potential (Murray 1986). Pasagshak River State Recreational Site is the only designated park land outside of the immediate city area but still within the road system (Figure 2). The mouth of the Pasagshak River is also a prehistoric native settlement site (P. Saltonstall, Alutiiq Museum, personal communication).

Since 1968, Pasagshak River sockeye salmon escapement had been estimated post-season using both aerial and foot surveys of the spawning grounds. Although annual survey counts have been highly variable, sockeye salmon production has generally increased since that time (Figure 3). The current escapement goal for Pasagshak River sockeye salmon is a lower-bound sustainable escapement goal of 3,000 fish (Nemeth et al. 2010). Prior to the weir, escapement estimates were not made until well after the fish escaped the subsistence, sport, and commercial fisheries. Since escapement estimates were not made inseason, no management action to regulate harvests was possible and overharvest could have occurred but not have been detected until any action was too late.

Subsistence harvest of this salmon stock has been increasing since subsistence records were initiated in 1986. During 2008 and 2009 the Pasagshak River was the largest subsistence salmon

fishery in the Kodiak Management Area (Figure 4; J. Shaker, Fish and Wildlife Technician III, ADF&G, Kodiak, unpublished data; KMA). In 2010 and 2011, the Settler's Cove put and take subsistence and personal use fishery near the Village of Port Lions received unexpectedly large runs and Pasagshak River fell to the second largest subsistence fishery in the KMA. During recent years, two other significant sockeye salmon runs near the City of Kodiak, Afognak and Buskin lakes, have experienced important reductions in run size, restricted fishing opportunities, and total subsistence fishing closures in some years (Baer et al. 2009; Dinnocenzo et al. 2009; Jackson et al. 2010). Such restrictions on those stocks can displace users to other systems (Magdanz et al. 2003), leading to concern that without a weir in place, Pasagshak River sockeye salmon will incur increased harvest pressure while ADF&G is unable to monitor escapement inseason.

Timely inseason estimates of Pasagshak River sockeye salmon escapement were made during 2011 and 2012 through installation of a weir near the outlet of Lake Rose Teed. Age, sex, and length (ASL) data was also collected with a trap attached to the upstream side of the weir.

In addition to operating the weir, information on subsistence effort at the Pasagshak River was obtained through harvester interviews. ASL data from subsistence harvests was collected to augment ASL data obtained from the weir trap and provide valuable information on the harvest composition, size selectivity, and magnitude relative to escapement.

METHODS

The Pasagshak River weir was installed and fish tight on June 8, 2012, approximately 1 km downstream of the outlet of Lake Rose Teed, and escapement was enumerated through August 15. The gate to allow fish passage was opened daily, approximately every two to three hours between 7:00 AM and midnight. All species including sockeye, pink *O. gorbuscha*, chum salmon *O. keta*, and Dolly Varden *Salvelinus malma* were enumerated.

During the high tidal cycles (with higher high tides of at least 9.3 ft), a strong upstream current took place at the weir location. With the knowledge gained from the 2011 season that weir panels had to be secured to the tripods with Telespar® and lagbolts, the weir was able to withstand those currents during 2012.

ASL sampling from sockeye salmon caught in the fish trap was conducted with a weekly goal of 240 fish. Ideally, 80 fish were sampled on Wednesday, Friday, and Monday of each statistical week. All scales, when possible, were collected from the preferred area of each fish following procedures outlined by the International North Pacific Fisheries Commission (INPFC 1963). The "preferred scale" (located on the left side of the fish, two rows above the lateral line on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin) was removed with forceps and mounted on a scale "gum" card. The sex and length of the fish (fish length in millimeters from mid eye to tail fork) was recorded to field computers and the data was downloaded to laptop computers daily.

All scales collected were mounted on scale cards and impressions were made on cellulose acetate (Clutter and Whitesel 1956). Fish ages were assigned by examining scale impressions for annual growth increments using a microfiche reader fitted with a 48X lens following designation criteria established by Mosher (1968). Ages were entered directly into the salmon database using European notation (Koo 1962) where a decimal separates the number of winters spent in fresh water (after emergence) from the number of winters spent in salt water.

Peak subsistence effort (peak number of boats during the day) was estimated daily. Subsistence fishermen were interviewed approximately three times per week and ASL samples of their catch were taken. ADF&G technicians opportunistically contacted sockeye salmon subsistence fishermen on the fishing grounds in front of the Pasagshak River or at Pasagshak State Recreation Area boat landing. Following a set of brief introductory remarks by the technician, all subsistence users who agreed to be interviewed were asked a short series of questions to determine their level of effort at Pasagshak River (Appendix A). An effort was made to conduct interviews in a quantity proportional to subsistence effort.

RESULTS

The total sockeye salmon escapement through the Pasagshak River weir was 4,585 fish including 97 jacks (fish measuring less than 400mm, mideye to tail fork; Table 1). In addition 25 pink salmon, and 122 chum salmon (Table 1) passed through the weir. An estimate of in-river fish was made immediately prior to pulling the weir on August 15 and was added to the last days' count. The daily sockeye salmon escapement peaked from early to mid July, but a large proportion of the total escapement was limited to four or five single day peaks of escapement (Figures 5 and 6). In 2011, daily escapement was correlated with tidal cycles (Witteveen 2011), but this relationship was not apparent in 2012 (Figures 5 and 6). Sockeye salmon were often observed holding in various portions of the river for several days before they approached and passed through the weir.

In contrast to last season when fish passage averaged over 100 fish per day during the last three days of weir operation, counts were fairly low prior to pulling the weir, so a formal post weir estimate that used recent escapement trends was not calculated for the 2012 season.

Trapping fish at the weir for ASL samples proved to be difficult with lower escapement during 2012. A total of 214 fish were sampled from the escapement during 2012 (Table 2). Early season fish were especially difficult to get into the trap, but sampling was quite successful from the subsistence fishery early in the season (Table 3), and thus the total run was well represented.

The dominant age of Pasagshak River sockeye salmon escapement collected at the weir trap was age-1.3 fish which composed about 56.0% of the escapement (Table 2). Temporally, age-1.3 fish composition fluctuated throughout the run with age-0.2 and -0.3 fish increasing in proportion as the season went on. This was in opposition to the 2011 run during which the age 0.3 fish were dominant early in the run and decreased in proportion throughout the season. Age-1.1, -1.2, -2.1, -2.2, and -2.3 fish were also present.

The age of fish collected from the subsistence fishery was similar to the escapement ages with age-1.3 fish dominating the catch (66.8%; Table 3). Since most of the subsistence harvest sampling was concentrated at the beginning of the run, temporal observations were difficult (Table 3).

Pasagshak River sockeye salmon were large compared to other Kodiak Management Area sockeye salmon (Moore *In prep*) with an average length of 533 mm mid eye to tail fork from the escapement samples and an average length of 565 mm mid eye to tail fork from the subsistence samples (Tables 4 and 5). The overall unweighted KMA sockeye salmon average length was 516 mm and Saltery River sockeye salmon were the only stock larger on average (543 mm) than Pasagshak (Moore *In prep).*

Subsistence effort levels increased markedly during late June and appeared to slowly trail off through July (Figure 7); however, the observation level during early July was poor. It was difficult to obtain significant amounts of subsistence harvest for sampling since most fishermen cleaned fish as they were caught, two to three at a time. Only 199 fish were sampled the whole season. As a result, the number of ASL samples collected was not in proportion to the number of fish harvested as specified in the operational plan. To increase subsistence sample size, technicians would have to spend larger portions of time at the areas that subsistence fishermen come to shore which would detract from the time they spend counting fish through the weir. The gear used was consistently 5-1/4" stretched mesh gillnet, which is typical of that used to target sockeye salmon.

DISCUSSION

Passage of sockeye salmon through the Pasagshak River occurred primarily during early July through mid July, later than most Kodiak area early sockeye salmon runs but earlier than most late sockeye salmon runs (Foster 2011). Daily escapement seemed to be less dependent on tidal cycle (Figure 5) than the 2011 season; however, it is difficult to find correlations with smaller escapement magnitude. The 2012 escapement of 4,488 sockeye salmon was markedly lower than the 2011 escapement of 13,319 fish (Witteveen 2011).

Age composition of Pasagshak River sockeye salmon was primarily age-1.3, -0.2 and -0.3 fish. The high proportion of age-0.3 fish is not typical of most Kodiak area sockeye salmon systems (Foster 2011). Sockeye salmon systems within the Westward Region that typically produce age-0 fish similar to the Pasagshak system are those with a significant estuarine environment, areas with significant marine nutrient input, or protected marine rearing environments such as Cinder and Ilnik rivers and Upper Station (Foster 2011; Moore 2011).

Subsistence harvest effort appeared to peak in late June or early July with similar effort levels to 2011. While subsistence harvest records are not available until after the season, anecdotal information collected from Pasagshak area residents suggest effort was significantly reduced from recent years. This is likely due to decent runs at Buskin and Afognak rivers and Settler's Cove that may have dispersed a lot of the Kodiak area subsistence harvest compared to recent years.

The similarity in size and age between the weir ASL samples and the catch ASL samples suggest very little selectivity is occurring in the subsistence fishery and that the bulk of the subsistence harvest is bound for Pasagshak River. Pasagshak River sockeye salmon are large compared with most Kodiak area fish (Foster 2011) and could be the largest sockeye salmon on Kodiak Island.

With reliable escapement estimates provided by the weir along with reliable harvest estimates, a harvest rate for Pasagshak River sockeye salmon can be calculated for the first time. Sport and subsistence sockeye salmon harvest data is not available from 2012 yet; however, data from 2011 recently became available. Sport harvest of Pasagshak fish from 2011 totaled 1,592 sockeye salmon (ADF&G Sportfish Survey) and subsistence harvest was estimated at 5,352 sockeye salmon (ADF&G subsistence database). Commercial salmon fishing effort in Pasagshak Bay was very low with only 11 sockeye salmon harvested and the harvest in the statistical area of the Outer Ugak Bay Section adjacent to Pasagshak was only 32 sockeye salmon. The stock composition of other adjacent fishing areas is unknown and therefore, the run sized and associated harvest rate is considered a minimum. The total estimated harvest was 6,987 sockeye

salmon. Summing the harvest with 2011 escapement of 13,402 sockeye salmon results in a total run estimate of 20,389 fish. The harvest rate is calculated as:

$$HR = h/r \quad (1)$$

where

HR= harvest rate

h = harvest

r = run.

The harvest rate on Pasagshak River sockeye salmon by sport and subsistence fisheries was estimated at 0.35.

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TABLES AND FIGURES

Table 1.–Daily and cumulative counts of salmon passage through the Pasagshak River weir, 2012.

	Number of Salmon						
Date	Sockeye Adults	Sockeye Jacks	Sockeye Cumulative	Pink	Pink Cumulative	Chum	Chum Cumulative
8-Jun	0	0	0	0	0	0	0
9-Jun	0	0	0	0	0	0	0
10-Jun	3	0	3	0	0	0	0
11-Jun	0	0	3	0	0	0	0
12-Jun	2	1	6	0	0	0	0
13-Jun	0	0	6	0	0	0	0
14-Jun	1	0	7	0	0	0	0
15-Jun	4	1	12	0	0	0	0
16-Jun	30	1	43	0	0	0	0
17-Jun	1	0	44	0	0	0	0
18-Jun	4	0	48	0	0	0	0
19-Jun	94	2	144	0	0	0	0
20-Jun	0	0	144	0	0	0	0
21-Jun	48	6	198	0	0	0	0
22-Jun	98	1	297	0	0	0	0
23-Jun	0	0	297	0	0	0	0
24-Jun	5	0	302	0	0	0	0
25-Jun	121	5	428	0	0	0	0
26-Jun	22	0	450	0	0	0	0
27-Jun	188	5	643	0	0	0	0
28-Jun	49	1	693	0	0	0	0
29-Jun	10	0	703	0	0	0	0
30-Jun	11	0	714	0	0	0	0
1-Jul	70	4	788	0	0	0	0
2-Jul	0	0	788	0	0	0	0
3-Jul	1	0	789	0	0	0	0
4-Jul	67	4	860	0	0	0	0
5-Jul	14	0	874	0	0	0	0
6-Jul	448	15	1,337	0	0	0	0
7-Jul	242	2	1,581	0	0	0	0
8-Jul	16	0	1,597	0	0	0	0
9-Jul	22	1	1,620	0	0	0	0
10-Jul	19	1	1,640	0	0	0	0
11-Jul	324	17	1,981	0	0	0	0
12-Jul	37	1	2,019	0	0	0	0
13-Jul	2	1	2,022	0	0	0	0
14-Jul	0	0	2,022	0	0	0	0
15-Jul	40	0	2,062	1	1	2	2
16-Jul	110	0	2,172	1	2	0	2
17-Jul	35	0	2,207	0	2	0	2
18-Jul	395	7	2,609	0	2	0	2
19-Jul	356	0	2,965	1	3	0	2
20-Jul	91	5	3,061	0	3	4	6
21-Jul	2	1	3,064	0	3	0	6
22-Jul	0	0	3,064	0	3	0	6
23-Jul	1	0	3,065	0	3	0	6
24-Jul	164	2	3,231	1	4	2	8

-continued-

Table 1.–Page 2 of 2.

	Number of Salmon						
Date	Sockeye Adults	Sockeye Jacks	Sockeye Cumulative	Pink	Pink Cumulative	Chum	Chum Cumulative
25-Jul	101	0	3,332	0	4	2	10
26-Jul	6	0	3,338	0	4	0	10
27-Jul	118	0	3,456	0	4	2	12
28-Jul	11	0	3,467	0	4	0	12
29-Jul	9	0	3,476	0	4	0	12
30-Jul	410	5	3,891	4	8	10	22
31-Jul	93	3	3,987	0	8	0	22
1-Aug	109	0	4,096	1	9	0	22
2-Aug	281	3	4,380	0	9	1	23
3-Aug	33	0	4,413	0	9	0	23
4-Aug	0	0	4,413	0	9	0	23
5-Aug	0	0	4,413	0	9	0	23
6-Aug	17	0	4,430	1	10	10	33
7-Aug	0	0	4,430	0	10	0	33
8-Aug	73	2	4,505	0	10	23	56
9-Aug	8	0	4,513	0	10	0	56
10-Aug	1	0	4,514	0	10	0	56
11-Aug	0	0	4,514	0	10	0	56
12-Aug	0	0	4,514	0	10	0	56
13-Aug	1	0	4,515	0	10	1	57
14-Aug	0	0	4,515	0	10	0	57
15-Aug	70	0	4,585	15	25	65	122
Total	4488	97		25		122	

Table 2.–Age composition of Pasagshak River sockeye salmon interpolated to escapement, 2012.

Stat Week	Sample Fish		Ages 0.2	0.3	1.1	1.2	1.3	2.1	2.2	2.3	Total Fish
24	0	Percent	0	0	0	0	100	0	0	0	100
6/7-6/13		Numbers	0	0	0	0	6	0	0	0	6
25	0	Percent	0	0	0	0	100	0	0	0	100
6/14-6/20		Numbers	0	0	0	0	138	0	0	0	138
26	1	Percent	0.0	2.0	0.0	0.7	97.3	0.0	0.0	0.0	100
6/21-6/27		Numbers	0	19	0	6	473	0	0	0	499
27	7	Percent	0.0	28.6	0.0	9.5	61.9	0.0	0.0	0.0	100
6/28-7/4		Numbers	0	64	0	21	132	0	0	0	217
28	22	Percent	26.6	22.6	0.0	13.5	36.5	0.0	0.8	0.0	100
7/5-7/11		Numbers	334	241	0	151	387	0	8	0	1,121
29	31	Percent	10.3	16.4	0.0	12.6	58.2	0.0	2.5	0.0	100
7/12-7/18		Numbers	61	97	0	76	384	0	13	0	631
30	69	Percent	14.8	12.9	0.0	10.8	61.2	0.0	0.4	0.0	100
7/19-7/25		Numbers	99	95	0	80	439	0	6	0	720
31	38	Percent	24.5	8.6	0.1	13.0	53.4	0.1	0.0	0.3	100
7/26-8/1		Numbers	197	61	1	102	400	1	0	2	764
32	46	Percent	29.6	5.1	1.7	18.3	40.2	1.7	0.0	3.5	100
8/2-8/8		Numbers	117	24	5	69	179	5	0	10	409
33	0	Percent	30.4	4.3	2.2	19.6	37.0	2.2	0.0	4.3	100
8/9-8/15		Numbers	24	3	2	16	30	2	0	3	80
Totals	214	Percent	18.2	13.2	0.2	11.4	56.0	0.2	0.6	0.3	100
		Numbers	833	604	8	521	2,568	8	27	16	4,585

Table 3.–Age composition of Pasagshak Bay subsistence sockeye salmon catch, 2012.

		Ages					
Stat Week		0.2	0.3	1.2	1.3	2.3	Total
26 (Jun 21 - Jun 27)	Number	4	27	9	77	1	118
	Percent	3.4	22.9	7.6	65.3	0.8	
27 (Jun 28 - Jul 04)	Number	5	12	2	36	2	57
	Percent	8.8	21.1	3.5	63.2	3.5	
29 (Jul 12 - Jul 18)	Number	0	3	0	19	0	22
	Percent	0.0	13.6	0.0	86.4	0.0	
30 (Jul 19 - Jul 25)	Number	1			1		2
	Percent	50.0	0.0	0.0	50.0	0.0	
Total:	Number	10	42	11	133	3	199
	Percent	5.0	21.1	5.5	66.8	1.5	

Table 4.–Age, sex, and length (mm) composition of Pasagshak River sockeye salmon escapement, 2012.

	Ages					
	0.2	0.3	1.2	1.3	2.2	Total
Mean Length, Females	467	527	494	536	471	518
Standard Error, Females	13	5	12	4	0	4
Range, Females	411–580	489–557	412–559	442–576	471–471	411–580
Sample Size, Females	13	16	12	49	1	91
Mean Length, Males	515	577	541	559	0	550
Standard Error, Males	12	9	16	5	0	5
Range, Males	438–592	531–609	489–598	442–613		438–613
Sample Size, Males	16	9	8	43	0	76
Mean Length	494	545	513	546	471	533
Standard Error	10	7	11	3	0	3
Range	411–592	489–609	412–598	442–613	471–471	411–613
Sample Size	29	25	20	92	1	167

Table 5.–Age, sex, and length (mm) composition of Pasagshak Bay sockeye salmon catch, 2012.

	Ages					
	0.2	0.3	1.2	1.3	2.3	Total
Mean Length, Females	521	565	549	558	560	557
Standard Error, Females	7	6	48	6	15	7
Range, Females	508–532	535–592	501–596	275–609	545–574	275–609
Sample Size, Females	3	9	2	56	2	72
Mean Length, Males	535	576	533	573	621	569
Standard Error, Males	12.64	4.07	13.23	8.4	0	5.47
Range, Males	504–602	528–638	474–601	0–650	621–621	0–650
Sample Size, Males	7	33	9	77	1	127
Mean Length	531	573	536	567	580	565
Standard Error	9	4	13	5	22	4
Range	504–602	528–638	474–601	0–650	545–621	0–650
Sample Size	10	42	11	133	3	199

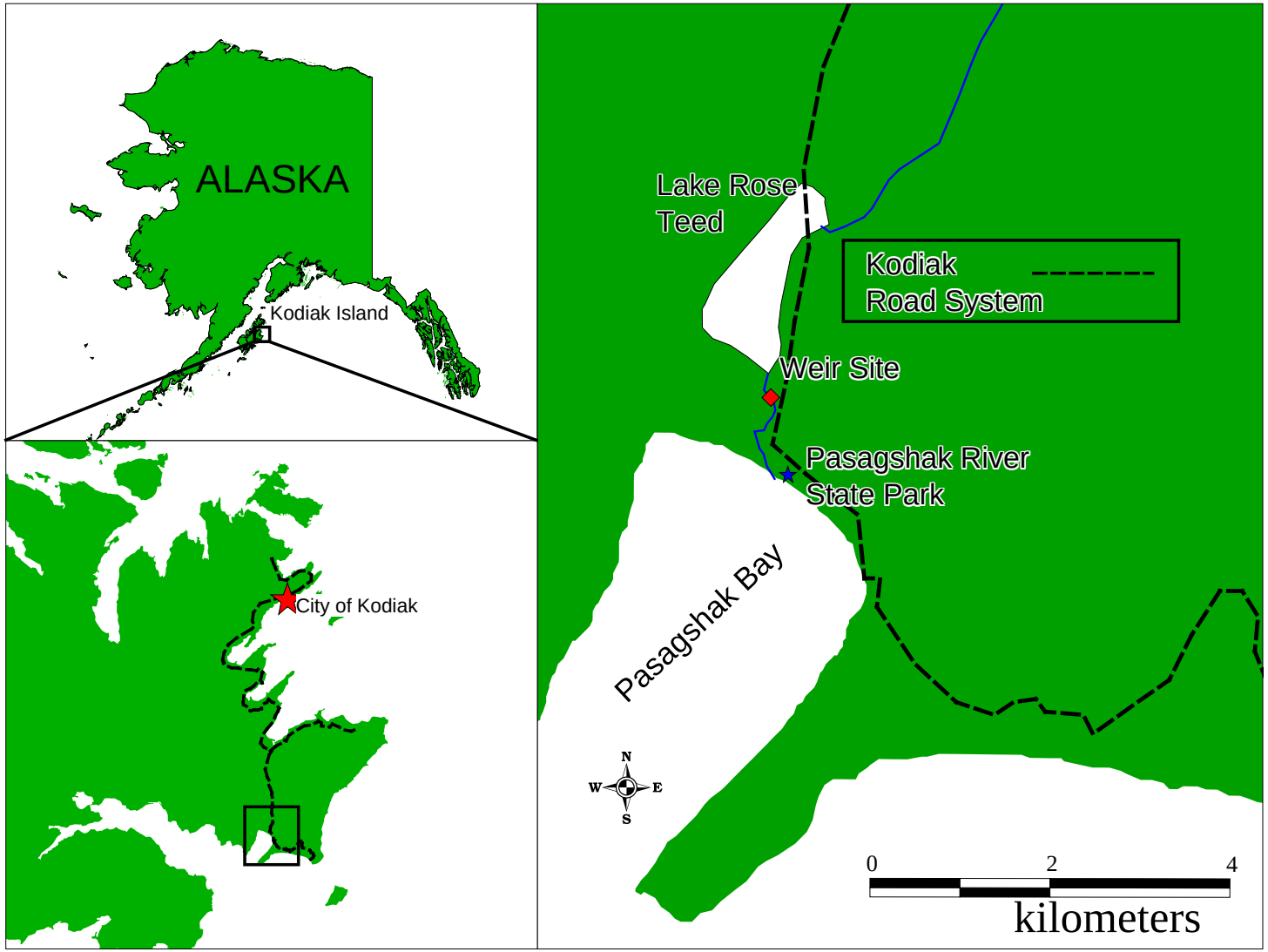

Figure 1.–Map depicting Pasagshak Bay and Lake Rose Teed area on the Kodiak road system.

Figure 2.–Aerial view of Pasagshak River State Recreation Area.

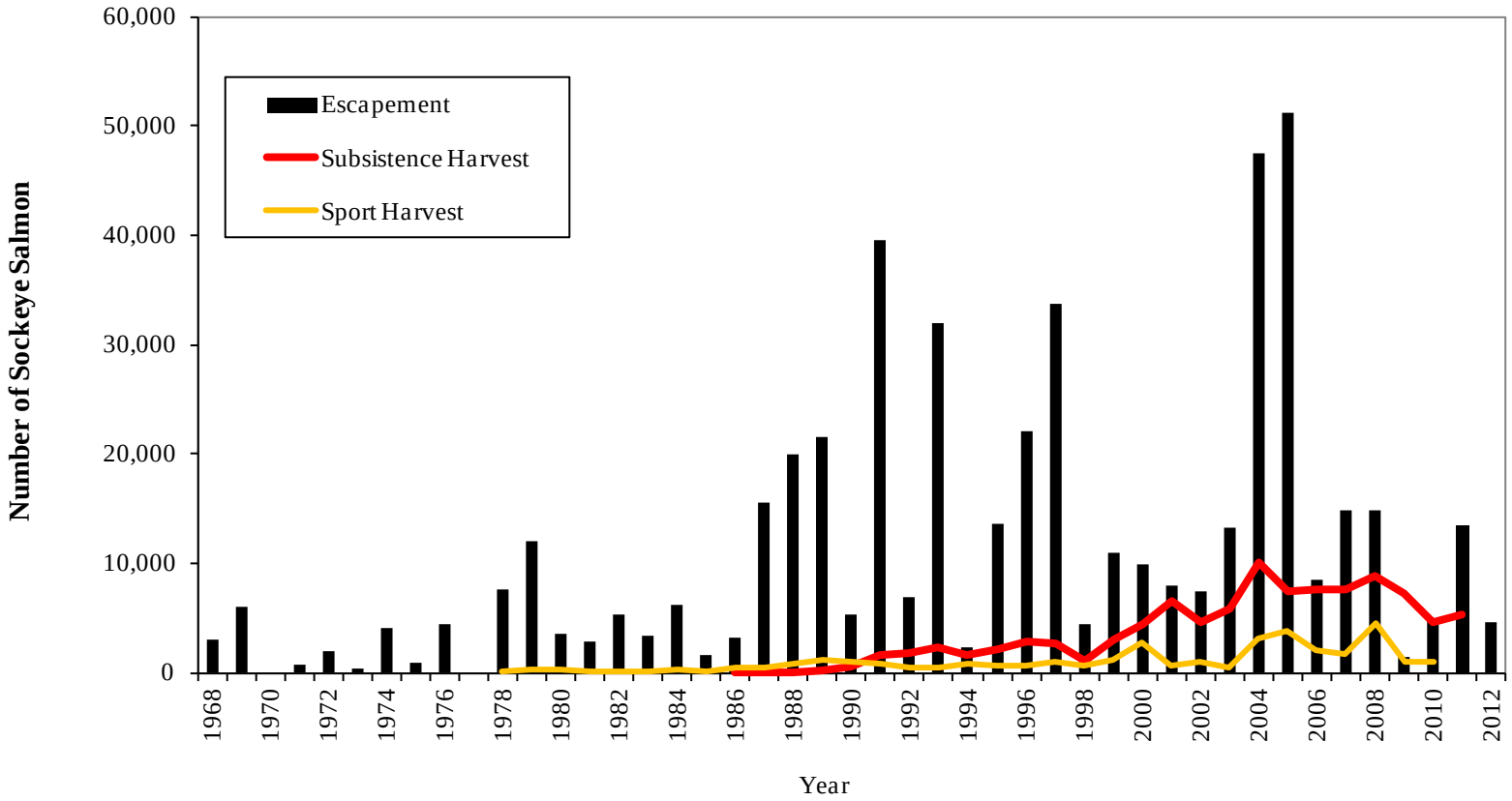

Figure 3.–Historical estimated sockeye salmon escapement and sport and subsistence harvest at Pasagshak River.

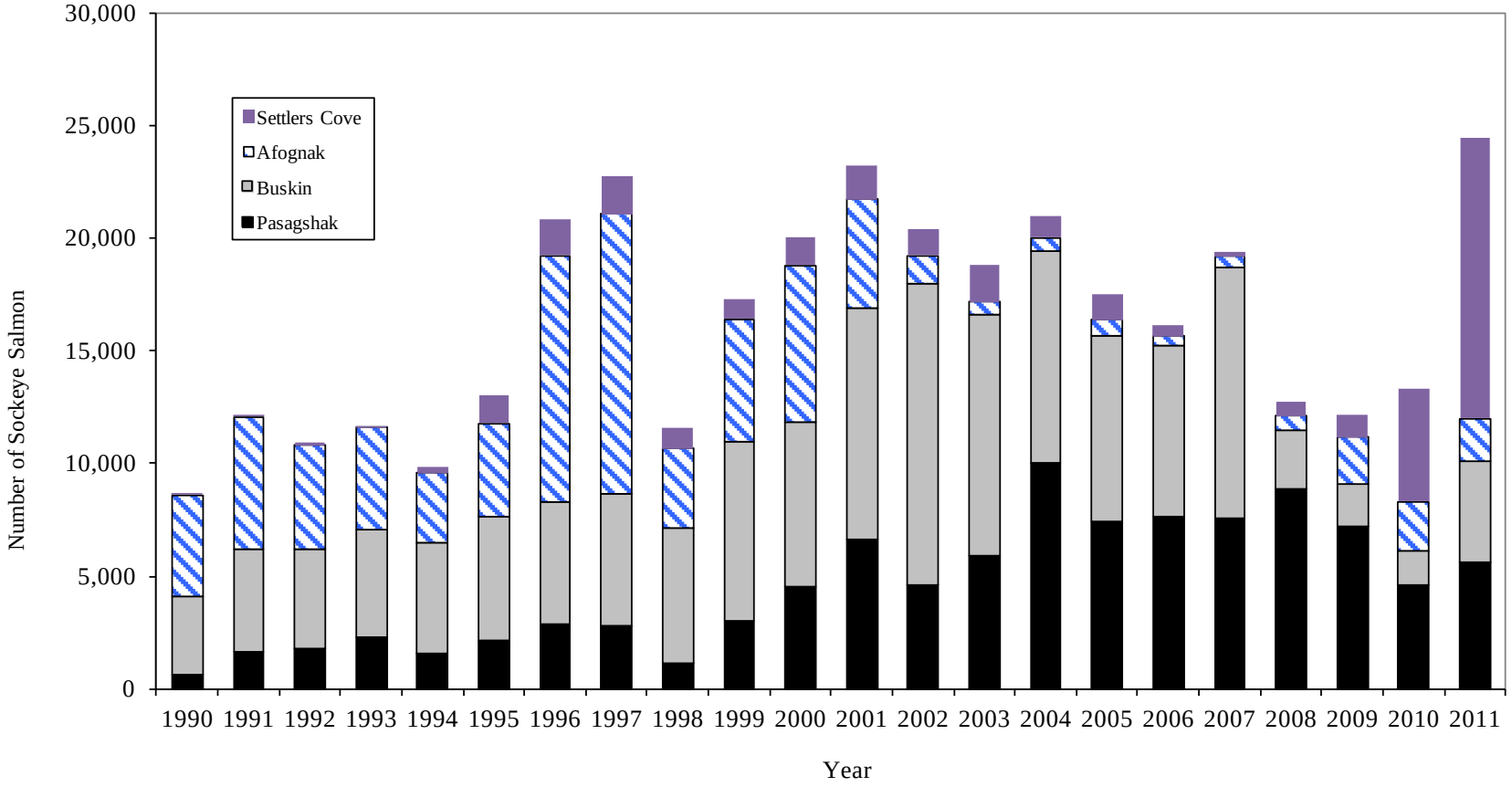

Figure 4.–Historical sockeye salmon subsistence harvest estimates for four important subsistence systems near the City of Kodiak.

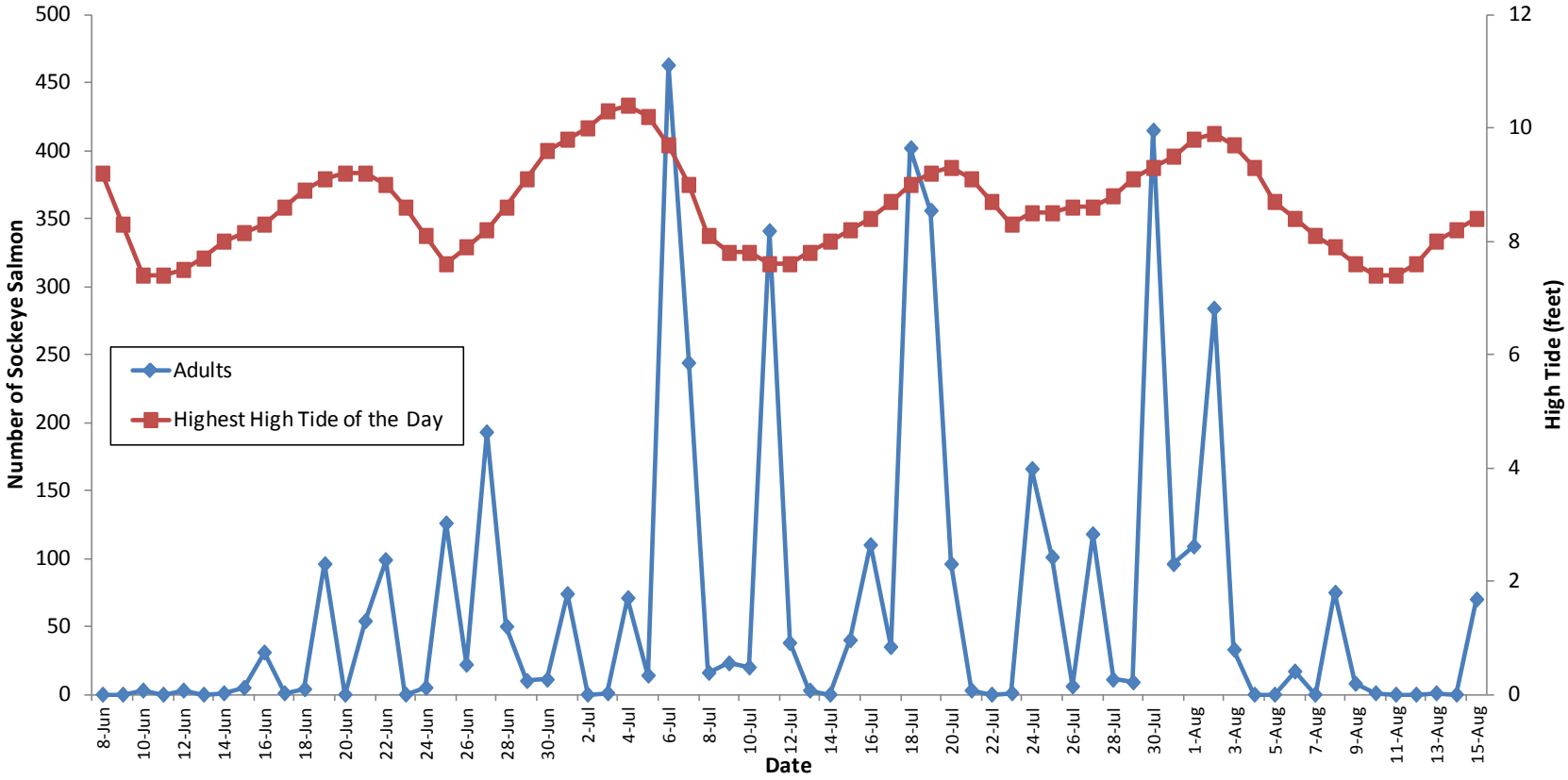

Figure 5.–Daily sockeye salmon passage through the Pasagshak River weir and the corresponding highest high tide of the day, 2012.

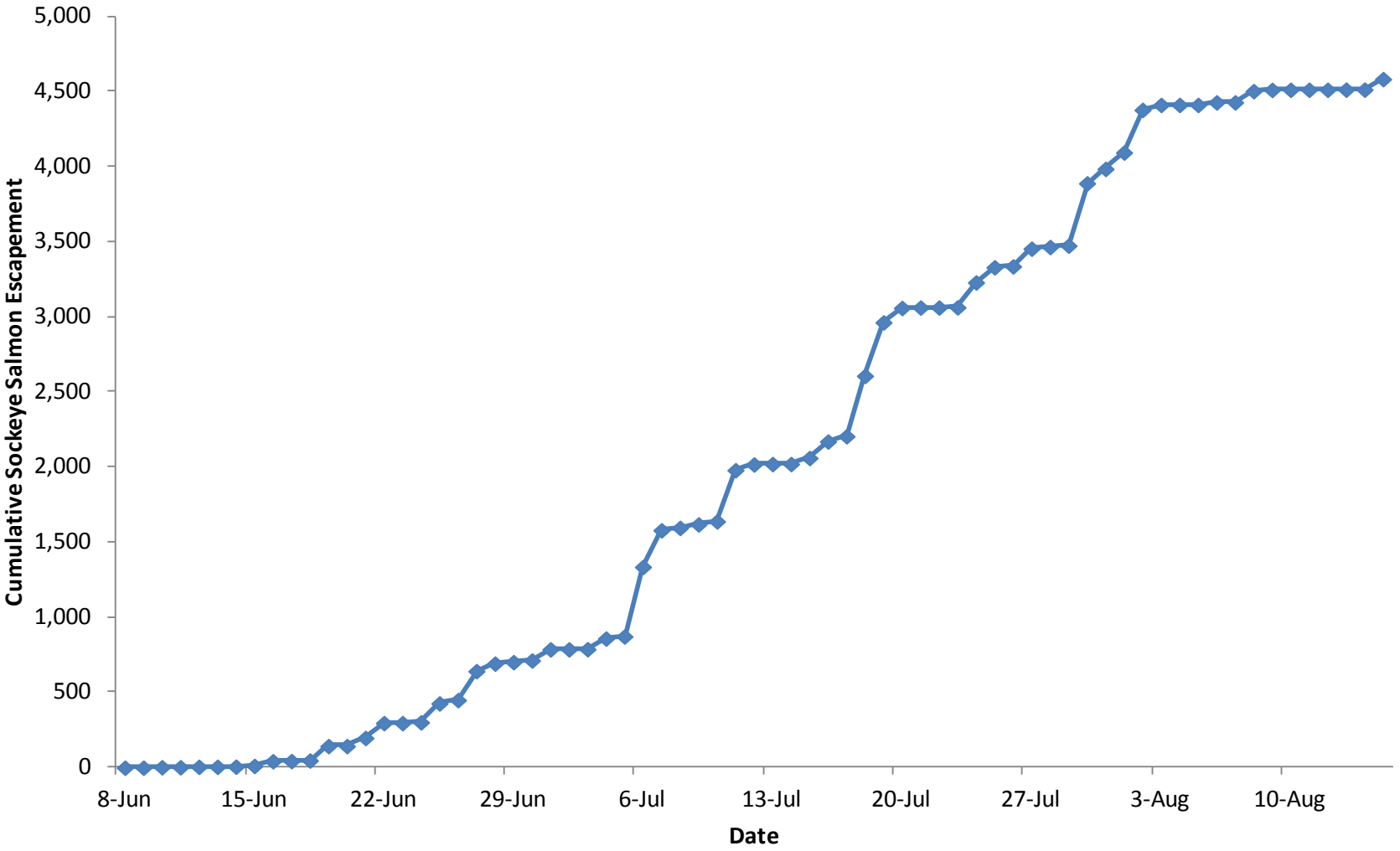

Figure 6.–Pasagshak River sockeye salmon cumulative escapement by day, 2012.

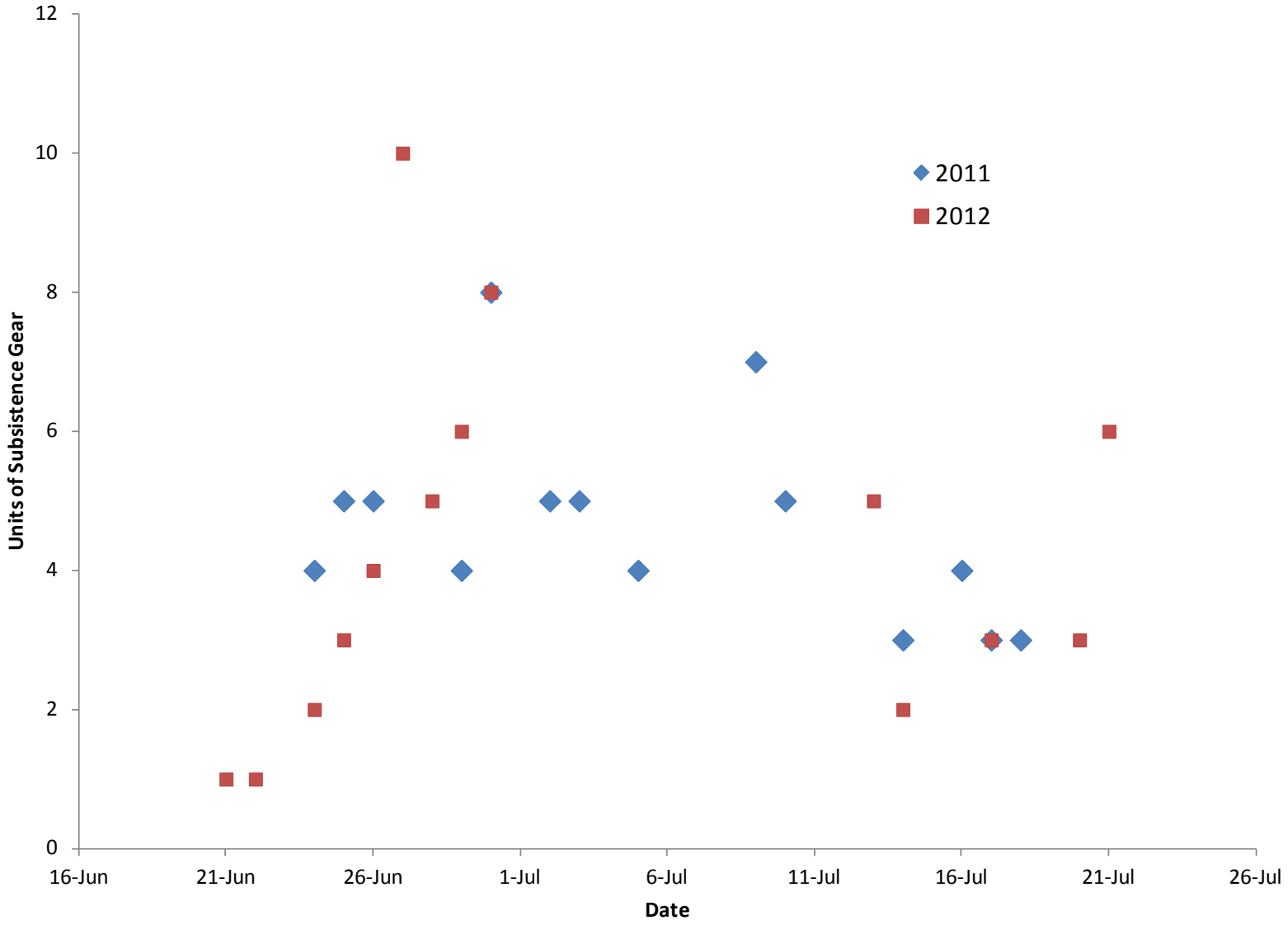

Figure 7.–Estimated daily subsistence fishing effort, measured by number of nets fishing, in Pasagshak Bay, 2011 and 2012.

APPENDIX A

Appendix A1.–Subsistence fishery interview form.

Daily Pasagshak Subsistence Fishery Data Sheet

Date: _____ Personnel: _____

Wx: _____

Peak Estimate of Effort
(Units of gear/boats) [ ]

Fishermen Interviews

Fisherman Name (Optional)	Number of Nets	Mesh Size	Hours Fished	Number of Sockeye Salmon Caught	# Collected For ASL	Card #	Fish #